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FOOD OF THE ROBINS AND BLUEBIRDS OF THE UNITED STATES.

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INTRODUCTION.

Few native American birds are more universally cherished than those well-known harbingers of spring, the robins and bluebirds. On esthetic grounds alone they receive full protection, partly from the romance that clusters about them in story and legend and partly because of their graceful shape and movement, bright color and pleasing song, and close association with man and his works. Quick to realize their safety the birds nest and rear their young about human abodes, and at times becomes very abundant, their numbers frequently reaching such proportions that apprehension is felt that they may become dangerous to agriculture and horticulture. A study of their economic status therefore is of the utmost importance, especially when it is considered that a bird's reputation is very often affected one way or the other merely by hearsay evidence.

Investigation discloses that in addition to their pleasing qualities robins and bluebirds perform a very useful function in reducing the hordes of insect life constantly preying upon the crops of the farmer. In this work a large part of their food consists of insects and they feed their young upon them almost exclusively. It is recognized that birds are one of the necessary checks provided by nature upon the increase of the vast number of insects produced each year; that without them there would be a greater destruction of vegetation; and that certain crops of the farmer now regularly matured would, if raised at all, be raised only with increased difficulty and added labor. Prominent among the insect eaters are the thrushes, the group which includes the robins and bluebirds.

In the thrush family of North America are 11 species, but passing by the less familiar members, the thrushes proper (*Myadestes* and

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NOTE.—This bulletin discusses the value of robins and bluebirds as insect destroyers and shows how the small damage done by the former may be reduced by supplying wild fruits to meet their requirements. It is for general distribution.

Hylocichla), there will be discussed in the present paper the food habits of members of the five species of American robins and bluebirds—the common robin (*Planesticus migratorius*), the varied thrush, or Oregon robin (*Ixoreus nævius*), the eastern bluebird (*Sialia sialis*), the western bluebird (*Sialia mexicana*), and the mountain bluebird (*Sialia currucoides*). While the ranges of these birds in their subspecies extend entirely across the continent, the best known are the common robin and the eastern bluebird. Time and the further advance of cultivation into wilder areas may bring the other species into greater prominence.

The American robin (*Planesticus migratorius* and subspecies) is one of the most familiar birds of the whole United States; and in the extreme northwest there is found also the varied thrush, or, as it is locally known, the Oregon robin (*Ixoreus nævius* and subspecies).

The eastern bluebird (*Sialia sialis* and subspecies) occupies the whole of eastern United States west to the base of the Rocky Mountains, and occurs also in southern Arizona; it is replaced beyond the mountains by two western species (*Sialia mexicana* subspecies and *Sialia currucoides*), which have much the same appearance and habits.

As robins and bluebirds are usually abundant wherever found the matter of their food supply deserves careful consideration, for wherever nature's lavish provision fails these birds must seek their subsistence either from cultivated crops or from the wild varieties especially left or provided for them by their human friends. A determination of the nature of their food therefore becomes of considerable economic importance. In the following pages is discussed in detail the economic status of the five species of these groups of birds.

ROBIN.

(*Planesticus migratorius* and subspecies.)

The common robin is probably the most familiarly known bird in the United States and has embellished the literature of its rural life to a greater extent than all other birds together. Having been made the object of a transferred affection it has received the love and protection which the ancestors of the American people formerly lavished upon the robin redbreast of Europe. The subspecies *Planesticus migratorius migratorius* is found throughout the United States east of the Great Plains and north of the Gulf States; and elsewhere are two closely related subspecies, one of which, *Planesticus migratorius propinquus*, is well known in the valley regions of the Pacific coast in winter and throughout the higher mountains in this section in summer; and the other, *Planesticus migratorius achrusterus*, is found in the higher regions of southeastern United States. The range of the species extends northward into Canada and even into Alaska.

While for the most part migratory in the northern half of the country, individuals remain all winter in many localities where shelter and food are assured. In eastern Massachusetts and at some places farther west there are cedar swamps which offer an abundant supply of wild fruit, and robins remain there throughout the winter in considerable numbers. Most of the species spend the winter from latitude 40° southward, and begin to move northward as soon as snow disappears. They arrive in New England in the latter part of March or early in April and in the northern States of the Mississippi Valley somewhat earlier. It is difficult to say just when the fall migration begins, as the first birds to leave are replaced by others from farther north. They are often very abundant in the latitude of Massachusetts during the first half of November, but by the last of the month all have either left for the south or retired into winter quarters.

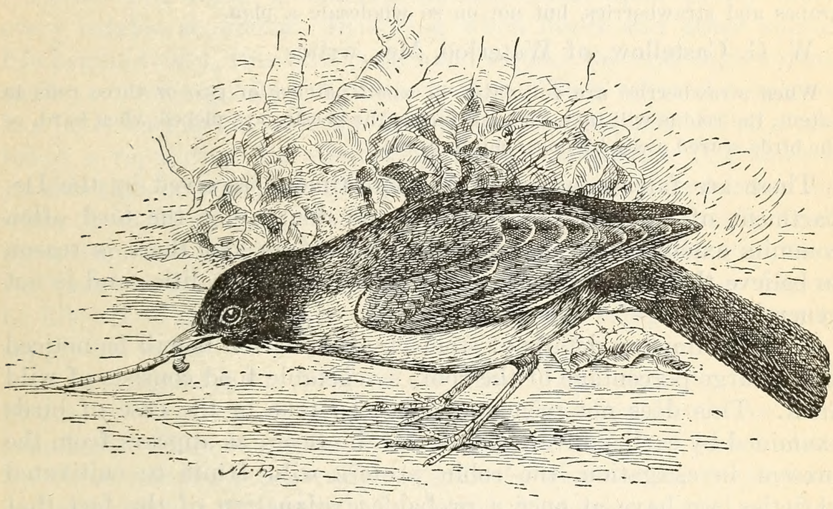

FIG. 1.—Robin (*Planesticus migratorius*).

In its breeding habits the robin is very domestic, having learned to place a good deal of confidence in its human neighbors. It commonly selects orchards as nesting places, or fearlessly builds upon a projecting shelf of a piazza or under an open shed where persons pass many times during the day. Stone walls and stump fences are often utilized, and in one case known to the writer the nest was placed directly upon the ground. The bird's confidence is rarely abused and it is allowed to rear its brood undisturbed wherever the nest may be. Four young are commonly raised in a brood and two or more broods are reared in a season. In the northern part of the country, especially in New England, the bird is thought so well of that one is rarely killed or disturbed.

Owing to the complete protection the species enjoys, it sometimes becomes overabundant for the best interests of horticulture, and its depredations upon small fruits are so extensive as to try the patience of its whilom protectors and friends, the fruit growers. In spite of this the law still extends its protecting arm over the bird in most parts of the country, and fruit growers have to guard their crops as best they can. Many who grow fruit for home consumption declare that the robins take more than half the crop, and some have testified that they often take the whole.

Robert B. Roosevelt, writing from Sayville, Long Island, N. Y., says:

> We have seven or eight cherry trees * * * in fair bearing of the finest sort. We never get a cherry! I mean this exactly. The robins eat or ruin the whole just before they get ripe enough for the human taste. They also take grapes and strawberries, but not on so wholesale a plan.

W. G. Castellow, of Waterloo, Me., writes:

> When strawberries are cultivated in small patches of two or three rods in extent, the robins will take them all unless the berries are picked when hard, or the birds scared away by dogs, children, etc.

These are fair examples of much testimony received by the Department of Agriculture. There is no doubt that the bird often commits extensive ravages among small fruits, but there is reason to believe that the damage is limited to certain localities and is not general.

In the following details of stomach examination it will be noticed that a large percentage of the robin's vegetable food consists of wild fruit. This does not seem to have been true in the case of birds examined by earlier investigators. If, however, as appears from the present investigation, the robin prefers wild fruits to cultivated varieties, we have at once a probable explanation of the fact that some parts of the country enjoy almost complete exemption from the ravages of which others complain.

For a number of years the writer was engaged in the cultivation of small fruits in Massachusetts, and although robins were abundant about the farm they did no appreciable damage. On the farm where the writer lived when a boy was a fine collection of the choicest varieties of cherries. The fruit first to ripen each year was shared about equally by the birds and the family, but that which matured afterwards did not attract the birds, probably because in that section the woods and swamps abound with many species of wild fruits.

Reports of depredations upon fruit by birds come principally from the prairie region of the West. This is just what might be expected, for but few prairie shrubs produce the wild berries that the birds prefer and for lack of these the birds naturallly feed upon the cultivated varieties available. Reports of fruit losses caused by birds in the East are usually from the immediate vicinity of villages or towns where there is no natural fruit-bearing shrubbery. From this it follows that an effective remedy for the ravages of birds upon cultivated fruits is to plant the preferred wild varieties. In the list given farther on (p. 13) are a number of species that are ornamental and usually are easily obtained.

On the western coast the habits of the robin appear to be the reverse of those of its eastern relative, for in summer it migrates northward or up into the high mountainous regions where it breeds, and in fall it returns to spend the winter in the valleys about orchards, vineyards, and cattle corrals; so that while in the East the robin is a summer bird, in the far West it belongs to the winter fauna.

Food.—The robin is omnivorous and feeds upon pretty much every eatable accessible. In spring when insect and other animal life begins to stir, this bird is on hand to take the first angleworms, snails, or sow bugs that show themselves. Then when the weather is a little warmer he takes the first beetles that appear, and so establishes a reputation for destroying useful Coleoptera (Carabidæ). At this time he eats the waste fruit left on the tree over winter, but when the early service berries (*Amelanchier*) ripen in June he feeds upon them, and later as the early cherries begin to color he tries them for variety. In July raspberries tempt his appetite and in August he fills up on grasshoppers. Thus each month brings something to supply his wants.

In investigating the food of the robin 1,236 stomachs from 42 States, the District of Columbia, and 3 Canadian Provinces were examined. They represent every month in the year and include the three subspecies generally recognized—*migratorius*, *propinquus*, and *achrusterus*. Analysis showed that the food consisted of 42.40 per cent animal matter and 57.60 per cent vegetable.

Animal food.—As the robin is an early migrant from the south he naturally preys on the first insects that come out from winter quarters. Useful Carabidæ, or predaceous ground beetles, which are among the earliest insects to appear in spring, form a very important element of the food of the first spring migrants among the birds. These beetles form 12.78 per cent of the food of the robin in April, and 8.57 per cent in March. After April, when other prey becomes more abundant, fewer appear in the food, but they are taken to some extent in every month and aggregate 5 per cent for the year. Beetles of the May-beetle family (Scarabæidæ) are eaten to the extent of 5.48 per cent of the yearly food, but in May, the month of their greatest abundance, they amount to 32.29 per cent, or nearly one-third of the diet. Various species of these beetles were found in 274 stomachs. Of these, *Lachnosterna*, the progenitors of the white grubs that eat the roots of grass and other plants, were found in 64. Several other species of the family nearly as harmful were identified. The Colorado potato beetle was found in 2 stomachs, and both the striped and spotted squash beetles were identified in others.

Larvæ of the Lampyridæ or fireflies, which live in the ground and so fall an easy prey to the robin, were found in several stomachs to the extent of upward of a hundred in each. Several species of weevils or snout beetles, including the two clover weevils (*Phytonomus punctatus* and *Epicærus imbricatus*), the corn weevil (*Sphenophorus zeæ*), and a number of others, were identified. In June, 1911, 10 stomachs of robins were collected in Utah in the region infested by the newly imported alfalfa weevil (*Phytonomus posticus*) and 6 were found to contain these weevils in varying quantities. In all, the birds had taken 17 adults and 195 larvæ, which amounted to an average of 35 per cent of the food of each. This shows how readily birds avail themselves of a new kind of food. Beetles collectively amount to 16.72 per cent, of which Carabidæ make up 5 per cent and Scarabæidæ 5.48 per cent. Weevils or snout beetles amount to 2.13 per cent, and all others 4.11 per cent.

The robin evidently is not a lover of Hymenoptera (bees, wasps, etc.) as the total consumption is only 2.60 per cent. Of these, 1.57 per cent are ants and the remainder, 1.03 per cent, wild bees and wasps, except a few bits of a single worker honey bee (*Apis mellifera*). This is in strong contrast to the food of birds of the genus *Hylocichla*, which consists on the average of over 12 per cent of ants. It is evident that the robin does not care for ants; and as it is not adept at capturing active creatures it is not surprising that it does not eat many wasps or bees.

Hemiptera (bugs) constitute only 2.20 per cent of the robin's food, but are taken to some extent in every month. February and April are the months of greatest consumption, with something over 5 per cent in each; March and May stand next with more than 3 per cent. While eight families were identified, the Pentatomidæ (stinkbugs) greatly predominate. Probably the most interesting member of this order eaten by the robin is the chinch bug (*Blissus leucopterus*). This injurious insect was found in two stomachs, and its presence was suspected in several more.

Diptera (flies) are represented in the food of the robin almost entirely by larvæ of the March flies (Bibionidæ). *Bibio albipennis*, the species most often eaten by robins, breeds in colonies in the ground, feeding on grass roots. Naturally they are not found by the birds so often as if they were more generally distributed, but when found the whole colony is eaten. While several stomachs contained less than 100 each of these larvæ, at least 12 contained from 100 to 200; one contained 270, and another the remarkable number of 1,040.

In this last case the bird probably had the good fortune to find several colonies. March flies are not considered very harmful insects, but are prolific breeders, and that they do not do more damage is probably because they are so persistently preyed upon by robins. In February and March the number of these larvæ eaten is about 10 per cent of the bird's diet. In other months it is considerably less. The average for the year is 3.14 per cent. A few crane flies (Tipulidæ) and a few bits of other Diptera were taken by robins, but they do not constitute an appreciable percentage of the food.

Lepidoptera (mostly caterpillars) form a regular and fairly abundant constituent of the robin's diet. The maximum consumption occurs in May, when this item amounts to 23.96 per cent of the food. After this it gradually decreases to a little more than 1 per cent in November, when it again rises toward its maximum. Owing to the soft nature of these insects, very few can be identified. The army worm (*Heliophila unipuncta*) was recognized in six stomachs, but was probably represented in many more; the codling moth caterpillar (*Carpocapsa pomonella*) was found in two stomachs; a cabbage worm (*Pontia protodice*) in one; and the yellow-necked apple-tree worm (*Datana ministra*) in three. Undoubtedly many more destructive species were contained in the food, though unrecognizable, but as practically all caterpillars are harmful, any destruction of them may be set down to the credit of the bird. The total consumption amounts to 9.04 per cent of the food.

Orthoptera (grasshoppers and crickets) as a general rule are acceptable food for insectivorous birds, and when abundant are eaten by almost every species. The robin, however, does not display any special fondness for them except during the short time when they are most abundant. The west-coast robin evidently relishes these creatures even less than does his eastern relative, but this perhaps is partly accounted for by the fact that but few stomachs of the western robin can be taken in the summer, as the bird spends that season either in the far north or in high mountain regions. It is remarkable, however, that as a general rule western birds do not eat grasshoppers with the gusto shown by the corresponding eastern species. The robin consumes the greatest quantity of grasshoppers from June to September, when 73 per cent of the total number taken during the year are eaten, or somewhat more than 10 per cent of the whole food. In August, as would be expected, the consumption is greatest and amounts to 17.33 per cent. In the same months the meadowlark eats grasshoppers to the extent of 67 per cent of his monthly diet. The average annual consumption by the robin is only 4.76 per cent, while with the meadowlark it is 28.30. It is evident that during most of the year these insects are eaten by the robin only when nothing better is at hand. *Melanoplus devastator*, a near relative of the

Rocky Mountain locust, was identified in one stomach and was probably represented in many more.

Miscellaneous insects of various orders, none of special interest, make up 0.37 per cent of the food. Spiders were eaten to the extent of only 0.83 per cent and Myriapods (thousand legs), 1.21 per cent. Various other animals such as sow bugs, snails, and angleworms were taken occasionally and make up the remainder of the animal food, 1.53 per cent.

Following is a list of the insects and other items of animal food with the number of stomachs in which found:

HYMENOPTERA.

Pimpla marginata	1
Camponotus pennsylvanicus	1
Apis mellifera	1

COLEOPTERA.

Cicindela hirticollis	1
Cicindela punctulata	1
Cychrus lecontei	1
Cychrus obliquus	1
Elaphrus riparius	1
Elaphrus sp	2
Pasimachus sp	1
Scarites subterraneus	1
Dyschirius basalis	1
Dyschirius sp	1
Clivina punctulata	1
Clivina bipustulata	2
Podabrus aterrimus	1
Pterostichus morio	1
Evarthrus sodalis	1
Evarthrus sp	1
Amara impuncticollis	2
Amara interstitialis	6
Amara sp	8
Calathus gregarius	1
Platynus brunneomarginatus	1
Platynus limbatus	1
Platynus æneolus	1
Galerita sp	1
Lebia sp	1
Chlænius sp	2
Geopinus incrassatus	1
Cratacanthus dubius	2
Agonoderus lineola	1
Agonoderus pallipes	10
Agonoderus sp	1
Harpalus herbivagus	1
Harpalus pleuriticus	1

COLEOPTERA—Continued.

Harpalus sp	5
Selenophorus pedicularis	1
Stenolophus conjunctus	2
Stenolophus ochropezus	1
Stenolophus dissimilis	2
Anisodactylus discoideus	1
Anisodactylus carbonarius	1
Cnemidotus callosus	1
Bidessus affinis	1
Helophorus sp	1
Hydrocharis obtusatus	1
Cymbiodyta fimbriata	1
Sphæridium scarabæoides	1
Silpha lapponica	2
Silpha ramosa	2
Silpha sp	2
Staphylinus vulpinus	1
Philonthus hepaticus	1
Philonthus fusiformis	1
Philonthus occidentalis	1
Leptacinus grandiceps	1
Stenus sp	1
Orthopterus scutellaris	1
Hippodamia convergens	1
Hippodamia sp	1
Coccinella 9-notata	1
Chilocorus bivulnerus	1
Languria mozardi	1
Tritoma angulata	1
Hister sellatus	2
Hister harrisi	1
Hister immunis	3
Hister abbreviatus	2
Hister militaris	1
Hister curtatus	1
Hister 16-striatus	5
Hister americanus	14
Hister 17-striatus	1
Hister sp	1

COLEOPTERA—Continued.	
Ips fasciatus	5
Cytilus sericeus	2
Byrrhus murinus	1
Lacon rectangularis	1
Monocrepidius vespertinus	2
Monocrepidius auritus	4
Monocrepidius bellus	3
Drasterius livens	1
Drasterius elegans	3
Drasterius sp	1
Dolopius lateralis	2
Melanotus cribricollis	3
Limonius subauratus	1
Corymbites cylindricollis	3
Telephorus bilineatus	2
Telephorus sp	2
Canthon simplex	1
Canthon sp	1
Copris minuta	1
Onthophagus hecate	9
Onthophagus sp	30
Ægialia opifex	1
Rhyssemus scaber	1
Rhyssemus sonatus	1
Atænius cognatus	13
Atænius imbricatus	1
Atænius sp	9
Aphodius fossor	2
Aphodius fimetarius	36
Aphodius ruricola	3
Aphodius serval	2
Aphodius inquinatus	45
Aphodius pardalis	2
Aphodius anthracinus	1
Aphodius robustus	1
Aphodius alternatus	3
Aphodius sp	27
Bolboceras farctus	1
Odontæus filicornis	1
Geotrupes blackburnii	2
Geotrupes sp	3
Macrodactylus subspinosus	1
Lachnosterna tristis	1
Lachnosterna sp	63
Anomala flavipennis	1
Anomala binotata	5
Anomala oblivia	1
Euphoria inda	4
Euphoria sp	1
Strangalia luteicornis	1
Chlamys plicata	4

COLEOPTERA—Continued.	
Pachybrachys hepatica	1
Myochrous denticollis	6
Typophorus canellus	1
Graphops nebulosus	1
Colaspis brunnea	12
Leptinotarsa 10-lineata	2
Calligrapha similis	1
Plagiodera viridis	1
Galerucella americana	2
Diabrotica 12-punctata	1
Diabrotica vittata	1
Cerotoma trifurcata	2
Œdionychis interjectionis	1
Disonycha crenicollis	2
Disonycha sp	1
Odontota dorsalis	1
Haltica fuscoænea	1
Haltica tombacina	2
Systena elongata	2
Chætochnema denticulata	1
Cassida bivittata	1
Epitragus canaliculatus	1
Eleodes sp	3
Opatrinus sp	1
Blapstinus abbreviatus	1
Blapstinus pratensis	1
Blapstinus sp	1
Notoxus denudatus	1
Notoxus hepaticus	1
Notoxus sp	11
Thecesternus humeralis	1
Thecesternus sp	1
Epicærus imbricatus	1
Graphorhinus vadosus	1
Amnesia sordida	1
Amnesia sp	1
Phyxelis rigidus	1
Mylacus soccatus	2
Geoderces melanothrix	1
Cercopeus chrysorrhœus	1
Otiorhynchus ovatus	4
Tanymecus confertus	2
Aphrastus tæniatus	2
Sitones lineellus	3
Sitones californicus	1
Sitones flavescens	7
Sitones hispidulus	4
Sitones binellus	1
Sitones sp	5
Phytonomus punctatus	4
Phytonomus nigrirostris	1

COLEOPTERA—Continued.

Phytonomus posticus	6
Macrops sp	8
Cleonus 4-lineatus	1
Cleonus sp	1
Onychylus nigrirostris	1
Onychylis sp	1
Conotrachelus anaglypticus	2
Conotrachelus sp	1
Acalles clavatus	1
Tyloderma æreum	1
Tyloderma nigrum	1
Tyloderma baridium	1
Tyloderma angustatum	1
Rhinoncus pyrrhopus	2
Baris ærea	1
Centrinus picumnus	1
Balaninus sp	2
Sphenophorus parvulus	11
Sphenophorus zeæ	3
Sphenophorus sp	3

DIPTERA.

Bibio albipennis	24

LEPIDOPTERA.

Pontia protodice	1
Hadena sp	1
Mamestra subjuncta	1
Heliophila unipuncta	6
Catocala sp	1
Arachnis zuni	1
Schizura concinna	1
Datana ministra	3
Carpocapsa pomonella	2

NEUROPTERA.

Corydalis sp	1

HEMIPTERA.

Tibicen septendecim	2
Dræculacephala reticulata	1
Xerophlœa viridis	1
Nezara hilaris	1
Nezara sp	1
Proxys punctulatus	1
Blissus leucopterus	2
Myodocha serripes	4
Euthoctha galeator	1
Leptoglossus oppositus	2
Metapodius femoratus	3
Corizus nigristernum	1

ORTHOPTERA.

Tettigidea lateralis var. *polymorpha*	1
Melanoplus devastator	1
Conocephalus sp	1

ARACHNIDA.

Phidippus audax	1

MOLLUSCA.

Helix mobileana	1
Orohelix strigosa	1
Succinea luteola	1
Succinea sp	1
Pupoides fallax	1
Lymnæa sp	1
Melampus bidentata	1

Vegetable food.—Over 50 per cent of the robin's food consists of fruit and more than four-fifths of this are wild species, even if strawberries, raspberries, and blackberries are classified as cultivated, which is not always the case. Many complaints have been made against this bird on the score of fruit eating and in many cases they are well founded. In the vicinity of towns where cultivation and improvements have swept away the wild fruits, or when for any reason the crops of wild fruit fail, the birds are forced to resort to cultivated varieties, and disaster to the farmer results.

While such cases are not numerous or of very great importance in the East, it is quite otherwise in California, where the robin is a winter bird and is abundant at just the time when wild fruits are largely out of bearing, except such as retain their fruit over winter. In years when this customary food is scarce, robins appear in the valleys in immense numbers and eat olives so eagerly and persistently that the loss is often serious and occasionally disastrous. Sometimes, indeed, it is only by the most untiring efforts with considerable outlay of labor and money that any part of the crop can be saved. Fortunately, such extensive damage is not done every year, although here and there the olive crop may suffer.

There is probably no more striking example of this exceptional and intermittent damage to fruit by birds than that which occurred in the winter of 1900–1901. In that year olive orchards in various parts of California were invaded by immense numbers of robins, which ate the fruit and in some instances destroyed the whole crop. Even in orchards where persistent effort was made to kill them or drive them away they ruined from one-fourth to one-half of the yield. Olive orchards in Santa Clara Valley were especially afflicted. Paul Masson, who owned two orchards near Saratoga, as quoted by the San Jose Mercury of January 17, 1901, says:

> In my largest orchard of about 500 trees adjoining a larger orchard of about 50 acres on the El Quito farm, which is owned by E. E. Goodrich, are thousands of robins, which are destroying all the fruit on the trees. About two months ago I estimated that my trees would yield about 4 tons of olives, but Sunday, when I visited my orchard, I found the fruit would not be worth picking.
>
> I killed some of the robins, and upon examination found as many as five or six whole olives in the crop of each bird. Besides those which the bird had swallowed whole, many olives are pecked so that they are spoiled for market. Sunday there were not less than 50,000 robins on my place, and they are equally as plentiful on El Quito farm.

Edward E. Goodrich, owner of the El Quito farm and olive orchard, quoted by the same authority, states:

> The so-called robin is a destructive pest to an olive orchard. A crop can not be saved when the migration of the robin corresponds exactly with the maturity of the olive, as it does this year, except by immediate picking, which is practically impossible, or by shooting so constantly as to prevent steady consumption. * * * In 1898 my crop was 130 tons, and should have made about 4,000 gallons of oil. Owing to the lack of rain the result was about 2,750 gallons, of the value of $11,000. Now, that crop could have been wiped out in 10 days by robins if they had been here as they were this season and no shooting had been done. So far as my foreman could estimate, before the birds descended upon the place, he placed the crop at a probable 3,000 gallons, which means when sold from $12,000 to $16,000, according to prices, and that would have been utterly destroyed but for the constant shooting the last 10 days.

As it was, Mr. Goodrich placed his loss on the olive crop through the devastations of the robins at 25 per cent of the whole, or about $5,000.

The San Jose Mercury also states:

> A representative of the Mercury visited the El Quito olive orchard to see what the facts were in this matter. He found a force of men picking the fruit as rapidly as possible, and he also saw thousands upon thousands of robins doing the same thing. On his way out he occasionally saw a single bird on the

fence or in a prune tree, but when he reached El Quito the sky was streaked with robins flitting about and having a gala time of it. Men were scattered about through the orchard with guns, and every few minutes the report of one of these would set the robins to flying, but in an instant they would settle down again and resume their feast.

Ellwood Cooper, of Santa Barbara, a prominent producer of olives on the Pacific coast, in a letter dated January 25, 1901, says:

> The robin is a terrible pest to olives. The birds do not always appear to come to the coast. My first experience was some 15 years ago. The olives were late in ripening. I was as late as March making oil. The robins appeared to come in by the thousands. My last orchard that year was about one-half mile in length. The pickers were at one end. I had a man with a gun at the other, but they would attack the middle, and when the gunner would reach them they would fly to the end he left. This year they have been particularly bad. My boys reported that the birds, mostly robins, picked more olives than they could. The foreman of the pickers told me that he had knocked from a tree one-quarter of a sack and went to dinner; when he returned not an olive was on the ground. I know that on the ground in one orchard where the rain had caused to fall as many olives as would fill a bushel basket, in a week not one would be seen. The robins do not seem to be able to pick the olives so rapidly from the trees, but peck at those that are commencing to dry, knock them to the ground, then get them. The birds at this writing are in all my orchards by the thousands. They do not appear every year. It has been my theory that the native berries in the Sierra some years are not in sufficient quantities for food.

In the last sentence Mr. Cooper has probably struck the root of the trouble. There is a crop of olives every year and the number of robins fluctuates little. Robins rarely attack olives because usually their native food abounds, but where this fails the hungry birds shift about until they find a substitute.

The most common complaints against the robin in the past have been on the score of eating cherries. Where a few trees are planted for family use it is not unusual for the birds to take all the fruit; especially is this the case in a village or the suburbs of a large town where wild berry-bearing shrubs have been destroyed. On farms distant from towns this seldom happens, though the birds are apt to take toll from the tree first to ripen its fruit. This seems to satisfy their taste for fruit, and after that they take only an occasional lunch. Reports are not wanting that the robin damages not only strawberries, blackberries, and raspberries, but also larger fruits, as pears, peaches, prunes, and grapes; but such cases are occasional and local and due to circumstances that also are occasional and local. In a region where fruit raising is new, pioneers in the business frequently suffer severe losses from birds that seem to be attracted by the novelty.

Of wild fruits properly so called the robin's dietary contains about 65 species, while the cultivated varieties amount to only about 10. The robin eats also seeds, but so few as plainly to show that they are not a favorite food. Of grain it eats rice, corn, oats, and wheat, but in such small quantities as to prove that they are not greatly relished. Apparently robins never are satisfied for any length of time without fruit or berries. Sparrows, blackbirds, and many other species thrive on dry seeds; not so robins. If berries are not at hand they move on to seek them. Sparrows remain in the north in severe weather, even when the ground is deeply covered with snow, if they can obtain plenty of seeds for food; but robins require for northern winter quarters a swamp where cedar, smilax, holly, etc., promise both shelter and food.

The robin among birds is one of the most efficient disseminators of fruit seeds. While small seeds like those of the raspberry and strawberry pass directly through the alimentary canal, larger seeds, like the stones of cherries, dogwood, pepper berries, china berries, and hackberries, are disgorged after the pulp is digested. In the Southern States it is common to see rows of cedar trees along fences where seeds have been dropped by perching birds, and lines of trees often mark the site of a fence which has long since disappeared. Seeds that have passed through the alimentary canal of birds or other animals do not appear to have their vitality impaired, and it has even been asserted that they germinate more readily than those sown directly from the tree.

Following is a list of vegetable substances found in the food of robins and the number of stomachs in which found:

Saw palmetto (*Sabal serrulata*)	2
Western juniper (*Juniperus monospermum*)	2
Red cedar (*Juniperus virginiana*)	18
Common juniper (*Juniperus communis*)	3
Panic grass (*Panicum* sp.)	3
Pigeon grass (*Chætochloa* sp.)	3
Rice (*Oryza sativa*)	1
Corn (*Zea mays*)	8
Oats (*Avena sativa*)	2
Wheat (*Triticum vulgare*)	3
Carrion flower (*Smilax herbacea*)	2
Green brier (*Smilax bona-nox*)	15
Saw brier (*Smilax glauca*)	3
Cat brier (*Smilax* sp.)	17
Bay-berries (*Myrica carolinensis*)	6
Fig (*Ficus* sp.)	3
Western hackberries (*Celtis occidentalis*)	22
Mississippi hackberries (*Celtis mississippiensis*)	24
Hackberries unidentified (*Celtis* sp.)	8
Mulberries (*Morus* sp.)	19
Mistletoe berries (*Phoradendron californicum*)	3
Dock (*Rumex* sp.)	1
Pale persicaria (*Polygonum lapathifolium*)	3
Smart weed (*Polygonum* sp.)	1
Amaranth (*Amaranthus* sp.)	2
Pokeberries (*Phytolacca decandra*)	15
Stellaria (*Alsine* sp.)	1
Barberries (*Berberis vulgaris*)	1
Red bay (*Persea borbonia*)	1
Spice berries (*Benzoin benzoin*)	3
Sassafras (*Sassafras variifolium*)	1
Currants (*Ribes* sp.)	12
Apple (*Pyrus malus*)	8
Crab apple (*Pyrus diversifolia*)	1
Mountain ash (*Pyrus americana*)	7
Western June berries (*Amelanchier florida*)	2
Alder-leaved June berries (*Amelanchier alnifolia*)	2
Service berries (*Amelanchier canadensis*)	12
June berries (*Amelanchier* sp.)	3

English hawthorn (*Cratægus oxycantha*)	2
Strawberries (*Fragaria* sp.)	6
Blackberries or raspberries (*Rubus* sp.)	47
Domestic cherries (*Prunus cerasus*)	34
Domestic prunes (*Prunus domestica*)	2
Wild black cherries (*Pruns serotina*)	28
Chokecherries (*Prunus virginiana*)	12
Bird cherries (*Prunus pennsylvanica*)	8
Cherries unidentified (*Prunus* sp.)	7
China berries (*Melia azederach*)	58
Wood sorrel (*Oxalis* sp.)	1
Staghorn sumac (*Rhus typhina*)	3
Smooth sumac (*Rhus glabra*)	19
Dwarf sumac (*Rhus copallina*)	10
Poison ivy (*Rhus radicans*)	3
Small-leaved sumac (*Rhus microphylla*)	1
Sumac unidentified (*Rhus* sp.)	12
Pepper berries (*Schinus molle*)	20
American holly (*Ilex opaca*)	19
Deciduous holly (*Ilex decidua*)	12
Black alder (*Ilex verticillata*)	3
Holly unidentified (*Ilex* sp.)	6
Strawberry bush (*Evonymus americana*)	2
Burning bush (*Evonymus* sp.)	1
Roxbury waxwork (*Celastrus scandens*)	2
Supple Jack (*Berchemia volubilis*)	9
Cascara sagrada (*Rhamnus purshiana*)	1
Woodbine (*Psedera quinquefolia*)	21
Northern fox grape (*Vitis labrusea*)	1
Summer grape (*Vitis æstivalis*)	1
Frost grape (*Vitis cordifolia*)	1
California wild grape (*Vitis californica*)	1
Unidentified grapes (*Vitis* sp.)	17
Flowering dogwood (*Cornus florida*)	59
Rough-leaved dogwood (*Cornus asperifolia*)	3
Panicled cornel (*Cornus paniculata*)	3
Alternate-leaved cornel (*Cornus alternifolia*)	1
Black gum (*Nyssa sylvatica*)	11
Tupelo (*Nyssa aquatica*)	6
Huckleberries (*Gaylussacia* sp.)	4
Small cranberries (*Vaccinium oxycoccus*)	2
Blueberries (*Vaccinium* sp.)	42
Persimmons (*Diospyrus virginiana*)	22
Olives (*Olea europæa*)	1
Button weed (*Diodia teres*)	2
Japan honeysuckle (*Lonicera japonica*)	1
Snow berries (*Symphorocarpos racemosa*)	4
Arrow-wood berries (*Viburnum dentatum*)	3
Black haw (*Viburnum prunifolium*)	2
Viburnum unidentified (*Viburnum* sp.)	1
Black elderberries (*Sambucus canadensis*)	8
Red elderberries (*Sambucus pubens*)	2
Elderberries unidentified (*Sambucus* sp.)	5
Common ragweed (*Ambrosia artemisiifolia*)	1
Other ragweeds (*Ambrosia* sp.)	7
Sunflower (*Helianthus* sp.)	1
Dandelion (*Taraxicum* sp.)	3
Fruit not further identified	71

Before dismissing the subject of vegetable food it is of interest to note that seeds of the California poison oak (*Rhus diversiloba*) were not found in the stomachs of west-coast robins. This appears the more singular when it is noted that the birds feed freely upon other species of *Rhus;* that this species is one of the most abundant shrubs in California, and in full fruit in the wintertime, when the robins are there; and that it is a favorite food of many species of winter birds. As the seeds of this plant are either regurgitated by birds or passed uninjured, it follows that birds are the most efficient disseminators of these noxious shrubs. This is one evil of which the western robins apparently are guiltless, though the eastern ones eat a few seeds of the poison ivy.

Among the stomachs examined were those of a few nestlings about half grown. Their food was not found to differ essentially from that of the adults except, perhaps, that the predominance of animal matter was more pronounced, and any great number of stomachs would have shown a considerably higher percentage. One somewhat peculiar feature of the stomach contents was a "wad" of grass or other vegetable fibers in a close tangle and large enough to half fill the stomach. This was found in nearly every stomach of the nestlings, and has also occasionally been observed in the stomachs of young of other species.

Summary.—While the animal food of the robin includes a rather large percentage of useful beetles, it is not in the consumption of these or any other insect that this bird does harm. A bird whose diet contains so large a percentage of fruit, including so many varieties, may at any time become a pest when its natural food fails and cultivated varieties are accessible. While the robin to-day probably is doing much more good than harm, it must be acknowledged that the bird is potentially harmful. In New Jersey it has been protected for years by law and also by public opinion, while the native berry-bearing shrubs have been destroyed and their places filled by domestic varieties; consequently the birds have been obliged to resort to cultivated fruits for food, while fruit growers have seen the berry crop, their principal source of income, disappear. It is not probable that individually fruit growers have derived benefit enough from the birds' insectivorous habits to counterbalance the loss suffered through their agency. Briefly, the conditions are: Too many birds of a single species and too little of their natural food. Under such circumstances there is no doubt that a law allowing the fruit grower to protect his crop when attacked by birds would be proper.

In California conditions are somewhat similar though differing in detail. The canyons and hillsides normally supply robins with their winter food. This, however, sometimes fails, especially since the hill and canyon lands have been cleared to bring them under cultivation as orchards and farms. It is not surprising that robins accept olives as a fair substitute for the *Madrona*, *Heteromeles*, and *Cascara* berries taken from them. Here again is found the very undesirable condition of too many birds of a single species collected in a limited area. They all demand the same kind of food, and when it fails the birds seek till they find an acceptable substitute. It is usually preferable to supply the food they desire, and for which they will amply pay, instead of killing the birds.

VARIED THRUSH, OR OREGON ROBIN.

(*Ixoreus nævius* and subspecies.)

The varied thrush, or Oregon robin, in its two subspecies ranges over the northwestern coast region as far north as Alaska and as far south as northern California. One subspecies, *Ixoreus nævius nævius*, is found from northern California to southeastern Alaska, and the other, *Ixoreus nævius meruloides*, from northwestern Canada to central and western Alaska. In winter the two subspecies move southward to southern California. As the country which it inhabits has been settled only in comparatively recent times the bird has not yet become very domestic. It is usually rather shy and much of the time keeps in the tops of trees. Eminently a forest or ravine bird, it prefers the darkest cover. While much resembling the robin in form and color it widely differs from it in demeanor. A 10-acre orchard is none too large for a robin's activities, while a hundred varied thrushes might occupy a similar area and no one would suspect their presence. They venture about houses occasionally, but always retreat at the first sight of human life.

The Oregon robin apparently consumes the least animal food of any member of the family. Eating a very few of many kinds of insects, it never gets a large percentage of any one kind. However, knowledge of the food of this bird is derived from the examination of stomachs taken in winter, whereas stomachs secured in the breeding season might lead to entirely different conclusions.

Although this bird is so shy and inhabits cultivated country during only the colder season, it has in some places made itself offensive by its attacks on cultivated crops.

In a letter from John M. Edson, dated at New Whatcom, Wash., May 8, 1899, it is stated:

> Numerous reports have come to me from farmers hereabouts corroborative of the statement of the inclosed newspaper clipping with reference to "Oregon robins" working havoc among the pea fields, where it is alleged acres of ground have been divested of seed by them. It is said they appear in large number, sometimes as many as 200 in a flock. The bird pulls up the pea by the sprout, which it breaks off devouring the kernel. * * * The allegations go so far in some instances as to accuse the birds of destroying other grain as well.

The newspaper clipping referred to is from the Seattle Times of May 4, 1899, and says in part:

> A new fruit and farm pest has appeared in western Washington, to the great detriment and loss of the farmers and fruit growers. A variety of the common brown thrush, which is known on this coast as the Oregon robin, is making sad havoc of the pea acreage in Whatcom and Skagit Counties. Farmers in these counties raise a great deal of peas and feed to hogs. The birds lay hold of the peas as soon as they peep from the ground and, pulling up the peas by the shoot, eat it.

This is a serious accusation. It is a common experience that where a country is newly settled or new crops are introduced crops are liable to attacks by birds, which appear to be attracted by the novelty of the unknown food. However, as 15 years have elapsed since the above letter was written, and as no corroborative report has since been received, it is fair to infer that the damage that year was due to unusual conditions.

Food.—The varied thrush appears to be a pronounced ground feeder, and the stomachs show an unusual quantity of such food as thousand-legs, sow bugs, snails, and angleworms; but spiders are rarely eaten. Only 58 stomachs of this thrush were available for examination, and these were taken in the months from October to April, inclusive. This leaves us in entire ignorance of the summer food. Analysis shows 25.85 per cent animal food to 74.15 per cent vegetable.

Animal food.—Useful beetles, mostly predaceous ground-beetles, amount to 1.87 per cent of the food. Beetles altogether aggregate only 4.46 per cent. They belong to about a dozen of the most common families with no great preponderance of any. Ants comprise 4.08 per cent of the food, and other Hymenoptera (bees and wasps), 2.24 per cent. Hemiptera (bugs) amount to 1.09 per cent; Diptera (flies), 1.47 per cent; Lepidoptera (caterpillars), 2.18 per cent; Orthoptera (grasshoppers and crickets), to 1.99 per cent; and all other insects, 1.18 per cent. None of these groups of insects attracted the bird's special attention during the months in which these stomachs were collected. Spiders also fail to please, as they were found only in the stomachs collected in two months and amount to only 0.10 per cent. Myriapods (thousand-legs) seem to be more highly relished, as they are taken to the extent of 3.08 per cent. Earthworms, snails, and sow bugs collectively amount to 3.97 per cent, and their presence in the stomachs explains why the bird so commonly frequents dark, shady brooks and springs. The food of the varied thrush thus widely differs from that of other members of the family in the small proportion of insects in the diet and in the comparatively large percentage of mud-inhabiting creatures, as angleworms, snails, etc.

The following beetles were the only insects that could be identified except as to family:

COLEOPTERA.

Quedius capucinus	1	*Aphodius* sp	2

Vegetable food.—The vegetable food of the varied thrush consists of fruit, weed seed, and mast, with some unidentifiable matter. In eating weed seed and mast the bird widely differs from other species of the family. Cultivated fruit, mostly waste or left over, amounts to 3.63 per cent for the season, and apparently consisted of apples, prunes, etc., left to dry upon the trees. Though no stones were found, some of the pulp appears to be of olives, and any olives consumed through the winter would, of course, be a loss to the grower. While the stomachs were not collected in the fruiting season eight species of wild fruit were identified. This comprised 23.21 per cent of the food and was found in every month in which stomachs were taken except April. The maximum amount, 73.67 per cent, is eaten in October when the bird returns from its summer home and wild berries are still on the bushes. Mast was perhaps the most unexpected food in the stomach of the varied thrush and was made up mostly of acorns. This item first appears in the stomachs taken in November, when it amounts to 76.71 per cent of the food. It decreases to the end of the season, except that none was found in four stomachs taken in February.

The habit of eating mast has undoubtedly developed from the fact that in the bird's winter residence acorns are abundant, fresh fruit not at all, and insects only in moderate numbers. The aggregate for the season is 18.86 per cent. Weed seed, another article of food too dry and hard for most thrushes, is eaten by the varied thrush to a very considerable extent during the four months from December to March. The average for each of those months is 16.78 per cent, but for the whole seven months is only 9.59 per cent. Miscellaneous articles of vegetable diet, such as seeds of sumac, poison oak, and ground up unidentifiable vegetable matter, amount to 17.18 per cent of the food. Rubbish, which completes the account, was found in several stomachs and amounts to 1.68 per cent.

Following are fruits, seeds, etc., identified, and the number of stomachs in which each was contained:

Juniper berries (*Juniperus* sp.)	1
Wheat (*Triticum vulgare*)	1
Amaranth (*Amaranthus* sp.)	1
Apple (*Pyrus malus*)	3
Blackberry or raspberry (*Rubus* sp.)	1
Filaree (*Erodium* sp.)	1
Pepper berries (*Schinus molle*)	1
Poison oak (*Rhus diversiloba*)	1
Sumac (*Rhus* sp.)	1
Buckthorn (*Rhamnus* sp.)	1
Black nightshade (*Solanum nigrum*)	1
California honeysuckle (*Lonicera hispidula californica*)	2
Round-leaved snowberry (*Symphorocarpos rotundifolia*)	1
Common snowberry (*Symphorocarpos racemosus*)	5
Fruit not further identified	8
Mast	16
Seeds unidentified	10

Summary.—From what is known of the insect food of the varied thrush, it does not appear that the bird is likely to do much mischief by eating useful insects. It takes but few, and these are so well distributed through the different orders and families that apparently no one species is unduly preyed upon. Quite a good portion of the animal food consists of creatures of little or no economic significance, as snails, sow bugs, and other inhabitants of wet, dark coverts. The bird does not at present spend the breeding season in a well-settled and cultivated country, and so does not overmuch trespass upon farm products. Only one report of damage has been received, but as that was a number of years ago it is probable that conditions at that time were exceptional.

EASTERN BLUEBIRD.

(*Sialia sialis* and subspecies.)

In the breeding season the range of the eastern bluebird (*Sialia sialis sialis*) covers the whole of the United States eastward of the base of the Rocky Mountains and extends into Canada. It winters as far north as Pennsylvania and southern Illinois. The azure bluebird (*Sialia sialis fulva*), a subspecies, replaces the eastern form in southern Arizona, and ranges farther south into Mexico. Naturally very domestic, the bluebird likes to build its nest in a cranny of a building, a box placed for its accommodation, or a natural cavity of a tree—preferably in an orchard. Deserted woodpecker holes or holes running down the center of old stumps are favorite places. Former nesting sites of bluebirds have in many instances been usurped by English sparrows, and many bluebirds thus driven away have betaken themselves to localities less settled and less frequented by the sparrow, where they can live and breed in peace. The bluebird is such an early spring migrant that many are overtaken by late snowstorms and perish. As a harbinger of spring it receives a kindly welcome, and boxes are often placed for its nest on buildings

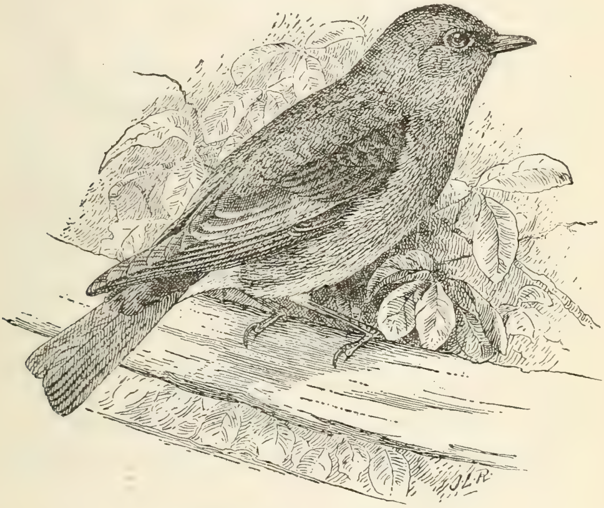

Fig. 2.—Bluebird (*Siala sialis*).

or posts where it is safe from cats and other prowlers. The bird has never been accused, in the writer's knowledge, of depredations upon cultivated crops or of making itself obnoxious in any way. Its food consists largely of fruit obtained from pastures, swamps, and hedgerows, rather than from gardens and orchards. It is a prolific breeder, rearing from four to six young in each brood, and usually bringing off two and frequently three broods a year. Some observers assert that the young of the first brood assist in feeding later broods.

Food.—For studying the food habits of the eastern bluebird 855 stomachs were available. They had been taken in every month of the year and in 28 States, the District of Columbia, and Canada. The food consisted of 68 per cent animal and 32 per cent vegetable matter.

Animal food.—The animal food is made up, for the most part, of insects, with a few spiders, still fewer myriapods, and a mere trace of other forms. Beetles constitute the second largest item of animal food and for the year average 20.92 per cent of the diet. Of these, 9.61 per cent are useful species, mostly predaceous ground beetles (Carabidæ). Few birds exceed this record of destruction of useful beetles. The bluebird eats them every month in such quantities as to indicate that they are an agreeable article of food. The maximum consumption, 19.51 per cent, occurs in May, and the minimum, 2.94, in September. This destruction of useful beetles has been considered by some writers a blot upon the fair name of the bluebird. The present writer, however, holds that a thorough study of the relations of birds and insects will demonstrate that the more omnivorous a bird is in its insect diet the more useful it is; that is, the most useful birds are those that impartially attack all species of insects available and thus tend to maintain a balance in insect life without exterminating one species or allowing another to become overabundant.

Beetles of the May-beetle family comprise 5.54 per cent of the diet, and while taken to some extent in every month, more than half are eaten in the three months from April to June. They consist mostly of *Lachnosterna* and small dung beetles (*Aphodius*). Weevils or snout-beetles, eaten but sparingly, amount to only 1.06 per cent for the year, and in the month of greatest consumption, February, they reach only 2.95 per cent. Various other beetles, all of a more or less harmful nature, amount to 4.71 per cent.

Ants in the diet of the bluebird amount to 3.48 per cent, a greater percentage than that of the robin. Other Hymenoptera (wasps and bees) amount to only 1.62 per cent, but it must be borne in mind that the bluebird is not especially active on the wing. Remains of a worker honeybee (*Apis mellifera*) were found in one stomach.

Diptera (flies), like Hymenoptera, are quick of wing and not easily taken either in midair or sitting; consequently they, too, enter lightly into the diet of the bluebird, the total for the year being only 0.26 per cent; they do not amount to 1 per cent in any month and are entirely missing in four. Hemiptera (bugs) are eaten in moderation every month. In July they amount to 6.49 per cent and in March 6.01 per cent, the highest two points of the year. The average for the 12 months is only 2.75. While a number of families were represented, the Pentatomidæ, or stinkbugs, predominated. Remains of chinch bugs (*Blissus leucopterus*) were found in one stomach.

Lepidoptera (caterpillars, with a few moths) form an important and regular article of food of the bluebird. The greatest consumption, 18.82 per cent, occurs in March, and the least, 4.58 per cent, in December. Most of these insects were of the family Noctuidæ or owlet moths whose larvæ are the well known cutworms, though a few belonged to the Arctiidæ of which the larvæ are hairy caterpillars. One of these, *Spilosoma virginica*, the yellow bear, was identified in three stomachs. The average consumption for the year is 10.48 per cent, the third greatest article of animal food.

Orthoptera (grasshoppers, crickets, and katydids) furnish the largest item of animal food, amounting to a good percentage in every month, and in August and September aggregating 52.68 and 53.47 per cent, respectively. The month of least consumption is January, when they amount to 5.98 per cent, and the average for the whole year is 22.01 per cent. The number eaten in each month is about proportionate to their abundance. Orthoptera are evidently a preferred food and sought for at all times. They were found in 423 stomachs and were the sole contents of 19. In only four months does the quantity eaten fall below 15 per cent of the whole food. Most insects of this order are harmful and when abundant are very destructive. Fortunately most birds are fond of these insects and eat them freely whenever obtainable, and some species not at other times remarkably insectivorous eat grasshoppers when they are superabundant.

A few insects of other orders were eaten very irregularly and amount to only 0.34 per cent of the food. Spiders, more relished by the bluebird than by the robin, constitute a fairly large percentage of the food from March to July, but are taken to some extent every month; the average for the whole year is 4.37 per cent. Myriapods (thousand-legs), which seem to be eaten whenever they appear in the open, were contained in small quantities in the stomachs taken in every month but two. The average for the year was 1.20 per cent. The remainder of the animal food (0.57 per cent) consisted of sow bugs, snails, and angleworms, with a few bones of lizards, tree frogs, etc.

Following is a list of insects and other animals identified in the stomachs of the eastern bluebird, and the number of stomachs in which found:

HYMENOPTERA.

Aphænogaster fulva	1
Tiphia sp	1
Anthophora sp	1
Bombus sp	1
Apis mellifera	1

COLEOPTERA.

Cicindela graminea	1
Cicindela repanda	1
Cicindela punctulata	2
Omophron labiatum	1
Omophron nitidum	1
Omophron americanum	1
Omophron sp	1
Carabus mæander	1
Carabus vinctus	1
Carabus sp	1
Dyschirius globulosus	1
Dyschirius æneus	1
Scarites subterraneus	1
Bembidium maculatum	1
Pterostichus lucublandus	2
Pterostichus femoralis	2
Amara elongata	1
Amara impuncticollis	11
Amara basilaris	1
Amara interstitialis	1
Amara obesa	1
Amara chalcea	1
Amara sp	1
Platynus punctiformis	2
Galerita janus	1
Chlænius pennsylvanicus	1
Chlænius tomentosus	1
Chlænius sp	1
Cratacanthus dubius	2
Agonoderus lineola	1
Agonoderus pallipes	4
Agonoderus sp	2
Harpalus viridiænus	1
Harpalus vagans	1
Harpalus pennsylvanicus	1
Harpalus herbivagus	1
Harpalus sp	3

COLEOPTERA—Continued.

Stenolophus sp	1
Anisodactylus rusticus	4
Anisodactylus nigrita	1
Anisodactylus opaculus	1
Anisodactylus agricola	3
Anisodactylus sp	3
Coptotomus longulus	1
Xantholinus obsidianus	1
Scaphisoma punctulata	1
Hippodamia parenthesis	1
Anatis 15-punctata	1
Phelister subrotundus	2
Saprinus fraternus	1
Cytilus sericeus	1
Byrrhus sp	1
Lacon rectangularis	1
Monocrepidius auritus	2
Drasterius elegans	2
Drasterius dorsalis	1
Corymbites cylindriformis	3
Limonius griseus	1
Chauliognathus marginatus	1
Chauliognathus pennsylvanicus	3
Chauliognathus sp	2
Telephorus sp	1
Canthon lecontei	1
Onthophagus hecate	5
Onthophagus tuberculifrons	1
Onthophagus sp	6
Atænius cognatus	1
Aphodius fossor	2
Aphodius fimetarius	43
Aphodius ruricola	1
Aphodius granarius	1
Aphodius inquinatus	48
Aphodius sp	8
Bolboceras farctus	1
Geotrupes splendidus	1
Lachnosterna tristis	1
Lachnosterna sp	3
Anomala binotata	3
Anomala varians	2
Ligyrus gibbosus	2
Aphonus sp	1
Euphoria sepulchralis	1

COLEOPTERA—Continued.

Euphoria inda	3
Euphoria sp	1
Tetraopes tetraophthalmus	4
Chlamys plicata	1
Myochrous denticollis	3
Colaspis brunnea flavida	1
Zygogramma suturalis	5
Zygogramma disrupta	1
Zygogramma sp	1
Plagiodera viridis	1
Diabrotica vittata	1
Cerotoma trifurcata	1
Disonycha sp	1
Haltica chalybea	1
Epitrix cucumeris	1
Systena elongata	1
Spermophagus robiniæ	1
Tribolium ferrugineum	1
Crymodes discicollis	1
Notoxus anchora	1
Melœ angusticollis	1
Epicauta vittata	1
Epicauta lemniscata	1
Epicœrus imbricatus	1
Anametis grisea	1
Tanymecus lacæna	3
Tanymecus confertus	2
Sitones lineellus	2
Sitones hispidulus	1
Sitones flavescens	1
Phytonomus punctatus	2
Macrops vitticollis	1
Macrops sp	3
Pissodes strobi	1
Pachylobius picivorus	1
Conotrachelus seniculus	1
Conotrachelus sp	1
Tyloderma baridium	1
Balaninus caryatrypes	1
Balaninus nasicus	2
Balaninus sp	2
Rhodobænus 13-punctatus	1
Sphenophorus sculptilis	1
Sphenophorus parvulus	3
Sphenophorus compressirostris	1
Sphenophorus venatus	1

COLEOPTERA—Continued.

Sphenophorus callosus	1
Sphenophorus sp	1

DIPTERA.

Gonia capitata	1
Drosophila sp	1

LEPIDOPTERA.

Hyperchiria io	1
Leucarctia acræa	3
Spilosoma virginica	3
Agrotis sp	5
Nephelodes violans	1
Nadata gibbosa	1

HEMIPTERA.

Agallia sp	1
Camirus porosus	1
Tetyra bipunctata	1
Cydnus communis	1
Apateticus maculiventris	1
Lygæus turcicus	1
Nysius angustatus	2
Blissus leucopterus	1
Alydus pilosulus	2
Sinea diadema	1
Camptobrochis sp	1
Corixa burmeisteri	1
Notonecta undulata	1

ORTHOPTERA.

Tettigidea lateralis	1
Hippiscus tuberculatus	1
Melanoplus femur-rubrum	1
Melanoplus bivittatus	1
Melanoplus atlanis	1
Udeopsylla nigra	1
Gryllus pennsylvanicus	1
Miogryllus saussurei	1

PLECOPTERA.

Perla sp	1
Nemoura sp	1

ARACHNIDA.

Phidippus sp	1

Vegetable food.—The vegetable portion of the eastern bluebird's food is largely fruit and mostly of wild species. Practically all of the domestic fruit taken was in June and July. Cherries and raspberries or blackberries were the only fruits really identified, though some pulp may have been of cultivated fruit. The most important vegetable food of the bluebird is wild fruit. The maximum quantity is eaten in December, when it amounts to 57.64 per cent. January comes next, but after that month the amount decreases rather abruptly to zero in May. No fruit, either wild or domestic, was found in the 58 stomachs taken in that month, but after that time the amount taken increases rapidly to its maximum in December. The average for the year is 21.85 per cent. At least 38 species of wild fruits were identified and probably more were present but not recognizable. The fruit-eating period of the bluebird is not in summer when the fruit is fresh on the tree, but from October to February, inclusive, during which months three-fourths of its fruit eating is done. From this it appears that fruit is really the winter food of the bluebird, tiding it over until insects are again abundant and taking the place of seeds eaten by so many birds at this season.

Seeds, however, are eaten by the bluebird, but only occasionally and sparingly. Apparently taken in spring, fall, and winter when nothing better offers they average for the year only 0.67 per cent. There is nothing to fear from the bluebird on the score of its eating grain, for this food was found in only two stomachs, one taken in January and the other in July. The first contained two kernels of wheat and nothing else, and in the second was found what appeared to be the ground-up pulp of wheat; the total percentage for the year is 0.32 per cent.

Under the head of miscellaneous vegetable food are included the seeds of sumac, both the harmless and poisonous kinds; the seeds of the bayberry; and a little indeterminate vegetable refuse and rubbish. The average for the year is 7.84 per cent, but for the five months from October to February these constitute a very fair proportion of the food. At this time of year seeds of the poison ivy, the poison sumac (in New England called dogwood), and the other sumacs are usually abundant and seem to be relished by many winter birds.

Following is a list of the various articles of vegetable diet identified in the stomachs of eastern bluebirds and the number of stomachs in which found:

Red cedar (*Juniperus virginiana*)	15
Panic grass (*Panicum* sp.)	3
Pigeon grass (*Chætochloa* sp.)	1
Wheat (*Triticum vulgaris*)	1
Asparagus berries (*Asparagus officinalis*)	1
False Solomon's seal (*Smilacina racemosa*)	2
Green brier (*Smilax bona-nox*)	1
Round-leaved brier (*Smilax rotundifolia*)	1
Cat brier (*Smilax* sp.)	1
Bayberry (*Myrica carolinensis*)	28
Hackberry (*Celtis occidentalis*)	12
Southern hackberry (*Celtis mississippiensis*)	3
Mulberry (*Morus* sp.)	2
Mistletoe berries (*Phoradendron flavescens*)	8
Sorrel (*Rumex* sp.)	1
Smart weed (*Polygonum* sp.)	2
Amaranth (*Amaranthus* sp.)	1

Pokeberries (*Phytolacca decandra*)	23
Red bay (*Persea borbonia*)	2
Currants (*Ribes* sp.)	1
Hawthorn (*Cratægus* sp.)	1
Blackberries or raspberries (*Rubus* sp.)	19
Rose haws (*Rosa* sp.)	1
Wild black cherries (*Prunus serotina*)	4
Chokecherries (*Prunus virginiana*)	4
Bird cherries (*Prunus pennsylvanica*)	1
Other cherries (*Prunus* sp.)	1
Staghorn sumac (*Rhus typhina*)	10
Smooth sumac (*Rhus glabra*)	22
Dwarf sumac (*Rhus copallina*)	11
Poison sumac (*Rhus vernix*)	2
Poison ivy (*Rhus radicans*)	19
Dahoon holly (*Ilex cassine*)	3
Deciduous holly (*Ilex decidua*)	1
Black alder (*Ilex verticillata*)	2
Ink berry (*Ilex glabra*)	35
Other holly (*Ilex* sp.)	1
Strawberry bush (*Evonymus americanus*)	2
Roxbury wax work (*Celastrus scandens*)	6
Purple haws (*Condalia* sp.)	1
Woodbine (*Psedera quinquefolia*)	31
Sarsaparilla (*Aralia* sp.)	1
Flowering dogwood (*Cornus florida*)	30
Rough-leaved dogwood (*Cornus asperifolia*)	11
Panicled cornel (*Cornus paniculata*)	4
Alternate-leaved cornel (*Cornus alternifolia*)	2
Other cornels (*Cornus* sp.)	2
Black gum (*Nyssa sylvatica*)	4
Huckleberries (*Gaylussacia* sp.)	4
Blueberries (*Vaccinium* sp.)	15
Persimmons (*Diospyros virginiana*)	1
Night shade (*Solanum* sp.)	1
Button weed (*Diodia teres*)	1
Partridge berry (*Mitchella repens*)	1
Tree cranberry (*Viburnum opulus*)	1
Arrow wood (*Viburnum* sp.)	1
Black elderberries (*Sambucus canadensis*)	23
Ragweed (*Ambrosia* sp.)	6
Fruit not further identified	19
Vegetable refuse or rubbish	28
Seeds not further identified	10
Mast	1

Summary.—Examination and analysis of the food of the eastern bluebird fully justifies the high esteem in which the bird is held. It does not prey upon any product of husbandry or in any way render itself injurious or annoying. During spring and early summer, when strawberries, cherries, and other small fruits are at their best, the bird subsists upon insects to the extent of five-sixths of its food, and in this period it eats more insects than at any other time of the year; in short the fruit-eating period of the bluebird is from late fall to early spring, when insects are scarce and waste fruit is available. The one point that has been urged against the bird is that it destroys a number of predaceous beetles. The harm done in this, however, is more apparent than real.

WESTERN BLUEBIRD.

(*Sialia mexicana* subspecies.)

The western bluebird (*Sialia mexicana occidentalis*), a subspecies of the Mexican bluebird (*Sialia mexicana mexicana*), occupies the Pacific coast from central California to Washington, and east to western Montana; another subspecies, the chestnut-backed bluebird (*Sialia mexicana bairdi*), is a bird of the Rocky Mountain and Great Basin region from Wyoming southward to northern Mexico; while a third form, the San Pedro bluebird (*Sialia mexicana anabelæ*), ranges from northern Lower California to southern California. The three forms will be treated together, and for convenience referred to as the western bluebird. It has the same gentle, quiet demeanor that characterizes its relative of the Eastern States and, although not quite so domestic, is much inclined to frequent orchards and the vicinity of farm buildings. While the eastern bluebird usually nests either in a hole of an orchard tree or in a box provided for its use, the western species has not fully abandoned forest trees as nesting sites and often may be found in lonely canyons or among hills far from the abodes of man. The orchards of the west coast are hardly old enough to offer many hollow trees as nesting places so attractive to this gentle friend. In time, however, this bluebird will without doubt become as domestic as the eastern species. In fact a nest was once found by the writer in a hollow tree in the home orchard of a ranch only a few rods from the house. The six young contained in this nest would seem to indicate that in fecundity the western species resembles its eastern cousin.

The western bluebird is less migratory than the eastern and does not entirely desert the United States in winter; so its good work is continuous. As insects are active in California in every month the bird is able to support life even without other food. Moreover, the bird renders a great economic service in the reduction of these pests at this season, for insects that live through the winter are the stock by which the species is perpetuated, and the destruction of a few at this time is equivalent to the death in summer of hundreds or even thousands.

Food.—For the investigation of the food of the western bluebird 217 stomachs were available. While the greater portion of these were collected in California a number are from Oregon, a few from British Columbia, and one from Texas. Every month in the year is represented, though several not so fully as desirable. The food was found to consist of 81.94 per cent animal to 18.06 per cent vegetable matter.

Animal food.—Useful beetles, mostly Carabidæ, with a few ladybirds (Coccinellidæ), were eaten to the extent of 8.56 per cent, a little less than the record of the eastern bluebird. Other beetles, all more or less harmful, amount to 15.44 per cent. No special preference for any family was shown. While ants constituted 5.38 per cent of the food, none were found in the stomachs taken in May or December, and they appear to be distributed rather irregularly; July, for instance, has nearly 19 per cent, and August only 1 per cent. Other Hymenoptera (wasps and bees) amount to only 1.26

per cent. No honey bees were found. Hemiptera (bugs) were found in the stomachs taken every month but April and August, but the quantity in each month varied greatly and irregularly. The average for the year is 6.38 per cent. A small quantity of black olive scales (*Saissetia oleæ*) were found in one stomach.

Caterpillars appear to be one of the western bluebird's favorite foods. These and a few adult moths were found in the food of every month except May, but as only two stomachs were taken in this month the omission is probably accidental. Their appearance in the stomachs is very irregular, but it would probably be more uniform if more stomachs were available. March is the month of greatest consumption (50.18 per cent), but August has nearly as much, and April and November are not far behind. The average for the year is 20.25 per cent. No special pest was identified, but practically all caterpillars are harmful.

Grasshoppers, which constitute the largest and most regular item of the western bluebird's food, are not eaten quite so freely as by the eastern bird, although in the Pacific coast region they can be obtained at all times of the year. The least consumption occurs in January, with 1.81 per cent of the whole food, and the greatest in May with 49.50 per cent. In the East the maximum of grasshopper eating with nearly all species of insectivorous birds is in August or thereabout. The average for the year with the western bluebird is 21.29 per cent, a little less than the record of the eastern species in a much shorter season.

Diptera (flies) are evidently not a favorite food of the western bluebird. In four months none were found, and in March, only, do they amount to 1 per cent; in that month they are eaten to the extent of 5.64 per cent of the diet, but the average for the year is only 0.72 per cent. A few other insects not included in the foregoing amount to 0.44 per cent. Spiders were found in the stomachs taken every month, but not in large quantities, the average for the year being 1.94 per cent. Myriapods (thousand-legs) were eaten still less than spiders. They appeared in the food of only five months, and amount to only 0.17 per cent. A few angleworms, snails, and sow bugs amount to 0.11 per cent, and complete the items of animal food.

Following is a list of the animal constituents of the western bluebird's food as far as identified, and the number of stomachs in which found:

HYMENOPTERA.	
Messor andrei (ant)	1
COLEOPTERA.	
Amara aurata	2
Silpha ramosa	1
COLEOPTERA—Continued.	
Hippodamia convergens	10
Coccinella californica	3
Lebasiella maculicollis	1
Vrilletta murrayi	1
Polycaon stouti	1

COLEOPTERA—Continued.

Aphodius granarius	3
Aphodius lividus	1
Aphodius inquinatus	5
Aphodius pardalis	1
Aphodius rubidus	3
Aphodius sp	10
Chrysomela sp	1
Eulabis pubescens	1
Blapstinus sulcatus	1
Blapstinus dilatatus	2
Blapstinus pratensis	1

COLEOPTERA—Continued.

Blapstinus pulverulentus	6
Blapstinus sp	4
Rhigopsis effracta	3
Sitones hispidiceps	1
Sitones hispidulus	1
Balaninus sp	1

HEMIPTERA.

Saisselia oleæ	1
Sinea diadema	1

Vegetable food.—The vegetable food of the western bluebird, like that of its eastern relative, consists largely of fruit, and mostly of the wild species of hillside and canyon. Grapes, which may have been cultivated, were found in 16 stomachs, all taken in late fall and winter. Rubus fruits (blackberries or raspberries) were found in 4 stomachs, prunes in 1, cherries in 1, and figs in 3. Most of these were taken in late summer or fall and do not indicate extensive ravages upon cultivated fruit. Of wild fruits, elderberries, found in 25 stomachs, appear to be the favorites. Mistletoe berries made up the entire contents of 7 stomachs, evidently a preferred article of diet when they can be obtained. Fruit altogether amounts to 14.79 per cent of the food and nearly all is either wild or waste. Weed seeds were eaten sparingly and irregularly, and amount to only 1.25 per cent of the food. No grain of any kind was found. A few odd items like poison oak and other Rhus seeds, with a little rubbish, make 2.04 per cent, and complete the vegetable food.

Following is a list of the various items of vegetable food, with the number of stomachs in which found:

Elderberries (*Sambucus* sp.)	25
California mistletoe (*Phoradendron californica*)	7
Dock (*Rumex* sp.)	1
Smartweed (*Polygonum* sp.)	2
Service bush (*Amelanchier alnifolia*)	2
Blackberry or raspberry (*Rubus* sp.)	4
Prune (*Prunus* sp.)	1
Cherry (*Prunus* sp.)	1
Grape (*Vitis* sp.)	16
Dwarf sumac (*Rhus copallina*)	2
Poison oak (*Rhus diversiloba*)	1
Pepper tree (*Schinus molle*)	2
Nightshade (*Solanum* sp.)	1
Figs (*Ficus* sp.)	3

Food of young.—Among the stomachs of western bluebirds examined were those of several nestlings about a week old. These were of interest as showing how large a proportion of animal food is given to the young. In one brood of six the only vegetable food found was a single piece of plant stem, probably given accidentally with other food, and properly classed as rubbish. The real food consists of grasshoppers and crickets, 90 per cent, and beetles, 3 per cent, the remainder being made up of bugs, caterpillars, and spiders. In another brood of four, grasshoppers and crickets constituted 97.5 per cent of the food, and one stomach contained nothing else. The remains of 11 grasshoppers were found in one stomach and 10 grasshoppers, a cricket, and a beetle in another. The only vegetable matter in the four stomachs was a single seed of *Polygonum*.

Summary.—That the western bluebird is an eminently useful species is so patent that it hardly needs to be pointed out. Whatever harm fruit growers have suffered from birds, none can be laid at the door of the western bluebird.

MOUNTAIN BLUEBIRD.

(*Sialia currucoides.*)

The mountain bluebird occupies in general the United States from the Rocky Mountains westward. A bird of the higher altitudes, it comes to the low valleys only in winter or during the prevalence of severe snowstorms in the mountains. As settlements encroach upon its range it adopts the habits of the eastern species and utilizes unoccupied crannies for nesting sites. In this the bird is said to be modifying its distribution, for it frequently finds such favorable localities for its nest that it remains and breeds in the lower altitudes instead of retiring to the mountains as formerly.

Food.—Only 66 stomachs of this species were available for investigation and these were not very regularly distributed, none being collected in May and November and only one each in February and October. The contents consisted of 91.62 per cent animal matter to 8.38 per cent vegetable. This is the highest percentage of animal matter of any member of the thrush family herein discussed and is equal to some of the flycatchers. It consists almost entirely of insects and a few spiders. The vegetable food is made up of fruit.

Animal food.—Beetles collectively amount to 30.13 per cent of the food and make the largest item. Of these 10.05 per cent belong to the three useful families—predaceous ground beetles (Carabidæ), tiger beetles (Cicindelidæ), and ladybirds (Coccinellidæ). In these items the food of the mountain bluebird exceeds that of any other species of thrush previously discussed. Weevils or snout-beetles (Rhynchophora) were eaten to the extent of 8.11 per cent, the highest record for any American thrush. As these are all injurious insects and some of them the worst pests in the insect world, this record for weevil destruction in some measure offsets the eating of useful beetles. The remainder of the beetle food was of more or less harmful families.

Ants were eaten by the mountain bluebird to the extent of 12.51 per cent. This record is not exceeded by any other bluebirds or robins. They were taken rather irregularly and in July amount to

31.50 per cent, or nearly one-third of the whole food. They made up 64 per cent of the contents of the one stomach taken in October, indicating that they are acceptable food when found. Other Hymenoptera (bees and wasps) amount to 3.80 per cent, a record fully up to the average of thrushes in general. Like ants they were taken rather irregularly and the maximum, 11.50 per cent, occurs in July. Hemiptera (bugs) amount to only 3.89 per cent and are not a very regular article of diet. In July they amount to 23.75 per cent, which is more than the combined amount for all other months. This record resulted from the fact that the contents of two stomachs collected in that month consisted almost entirely of small cicadas. Besides these, stinkbugs, negro bugs, assassin bugs, and jassids were taken. Diptera (flies), almost conspicuous by their absence, were found in the stomachs collected in April and September only, and amount to only 0.92 per cent for the year.

Lepidoptera (mostly caterpillars) are a rather regular article of food, amounting to 14.45 per cent for the year and constituting a large part of the food of every month in which stomachs were collected. In April they amount to 22 per cent and in September, in two stomachs taken, 48 per cent. It is probable, however, that the maximum consumption occurs in the early summer months. Orthoptera (grasshoppers, locusts, and crickets) are, next to beetles, the largest item of the food. Very curiously January shows the greatest consumption, 70.33 per cent; August, the normal grasshopper month, stands next with 53.86 per cent. The season seems to open in January and holds out with a good percentage in every month until it ends abruptly with 38.50 per cent in September. The average for the year is 23 per cent. This is higher than the record of any other thrush, though the other two bluebirds do not fall far behind. A few of the rarer insects, some spiders, thousand-legs, and a tick make up the rest of the animal food, 2.92 per cent.

Following is a list showing the insects identified and the number of stomachs in which found:

COLEOPTERA.

Amara interstitialis	1
Harpalus ellipsis	1
Silpha opaca	1
Hippodamia convergens	1
Syncalypta sp	1
Cardiophorus luridipes	1
Onthophagus sp	1
Aphodius fimetarius	1
Aphodius inquinatus	1
Dichelonycha sp	1
Chrysomela lunata	1

COLEOPTERA—Continued.

Centrioptera muricata	1
Thecesternus sp	2
Eupagoderes sp	1
Rhigopsis effracta	5
Trichalophus alternatus	1
Macrops sp	1

HEMIPTERA.

Zelus venardii	1
Sinea diadema	1

Vegetable food.—As with most of the other thrushes, the vegetable portion of the food of the mountain bluebird consists principally of small fruit. The currants and grapes found were in all probability domestic varieties, but as the grapes were from stomachs taken in December and January, and the currants from one taken in April, they can have but little economic significance.

Following is a list of the various items of vegetable food and the number of stomachs in which found:

Currants (*Ribes* sp.)	1	Grapes (*Vitis* sp.)	5
Elderberries (*Sambucus* sp.)	1	Unknown seeds	1
Sumac seeds (*Rhus* sp.)	1	Rubbish	4

Summary.—The mountain bluebird has probably not yet come in touch with the products of husbandry extensively enough to demonstrate its real propensities, but the nature of its food does not indicate that there is much to be feared from the bird. In the season of fruit and grain it subsists mostly upon insects and eats fruit and other vegetable food only in the season when nothing but left-over and waste products can be obtained.

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